

We claim:

1. A plurality of Q-based carbide nanofibrils predominantly having diameters substantially less than about 100 nm, where Q is any metal capable of forming a carbide.
2. The plurality of nanofibrils defined in claim 1, wherein said diameters are in the range of about 5-50 nm.
3. The plurality of nanofibrils defined in claim 2, wherein said diameters are in the range of about 5-20 nm.
4. The plurality of nanofibrils defined in claim 1, wherein most of individual ones of said nanofibrils have a generally uniform diameter.
5. The plurality of nanofibrils defined in claim 1, wherein said nanofibrils are predominantly unfused to one another.
6. The plurality of nanofibrils defined in claim 1, wherein Q is silicon.
7. The plurality of nanofibrils defined in claim 6, wherein said nanofibrils are predominantly each a single crystal.
8. The plurality of nanofibrils defined in claim 7, wherein said single crystal has a Beta crystal structure.
9. The plurality of nanofibrils defined in claim 6, wherein said nanofibrils are polycrystalline.
10. A method of making a plurality of Q-based carbide nanofibrils predominantly having diameters substantially less

than about 100 nm, comprising the steps of: heating a plurality of carbon nanotubes or nanofibrils predominantly having diameters less than about 50 nm in a reaction chamber in the presence of a Q-based gas of the form Q_nA_m , where A is an element or radical and n and m are integers necessary to satisfy valences, and an inert gas in a reaction vessel to a temperature substantially less than 1700 C but sufficiently high to cause substantial reaction of said Q-based gas with the carbon of said carbon nanotubes or nanofibrils to form, in situ, solid Q-based carbide nanofibrils and an A-based gas, said temperature being sufficiently low to prevent substantial fusing together of individual ones of said carbide nanofibrils, removing at least a portion of said A-based gas from said reaction chamber as said reaction progresses, and maintaining said temperature until substantially all the carbon of said nanotubes or nanofibrils has been converted into Q-based carbide.

11. The method defined in claim 10, wherein said temperature is between about 1000 C and about 1400 C.

12. The method defined in claim 11, wherein said temperature is about 1200 C.

13. The method defined in claim 10, wherein the diameter of said carbide nanofibrils is no more than about double that of the carbon nanotubes or nanofibrils from which they were made.

14. The method defined in claim 10, wherein said carbide nanofibrils predominantly have diameters in the range of about 5-50 nm.

15. The method defined in claim 14, wherein said carbide nanofibrils predominantly have diameters in the range of about 5-20 nm.

16. The method defined in claim 10, wherein substantially the only source of carbon-containing material introduced into said reaction chamber is said carbon nanotubes or nanofibrils.

17. The method defined in claim 10, wherein Q is silicon.

18. The method defined in claim 17, wherein said A is oxygen.

19. The method defined in claim 17, wherein said carbide nanofibrils are predominantly each a single crystal.

20. The method defined in claim 19 wherein said single crystal has a Beta crystal structure.

21. The method defined in claim 17, wherein said carbide nanofibrils are polycrystalline.

22. The method defined in claim 10, wherein said carbon nanotubes or nanofibrils are of the type having multiple graphitic carbon layers arranged concentrically around the axis of each of said nanotubes or nanofibrils.

23. The method defined in claim 10, wherein said carbon nanotubes or nanofibrils are of the type generated by catalytic decomposition of a carbon-based gas.

24. The method defined in claim 10, wherein said carbon nanotubes or nanofibrils are substantially free of a thermal carbon overcoat.

25. A plurality of Q-based carbide nanofibrils pseudo-topotactically grown from a plurality of carbon nanotubes or nanofibrils having a macroscopic morphology, said carbide nanofibrils predominantly having diameters substantially less than about 100 nm, where Q is any metal capable of forming a carbide.

26. The plurality of Q-based carbide nanofibrils defined in claim 25, wherein said carbide nanofibrils are pseudo-topotactically grown at between about 1000 C and 1400 C.

27. The plurality of Q-based carbide nanofibrils defined in claim 26, wherein said carbide nanofibrils are pseudo-topotactically grown at about 1200 C.

28. The plurality of Q-based carbide nanofibrils defined in claim 25, wherein said plurality of carbon fibrils are made by catalytic decomposition of a carbon-based gas.

29. The plurality of Q-based carbide nanofibrils defined in claim 25, wherein said carbide nanofibrils

substantially retain said macroscopic morphology of said plurality of carbon nanotubes or nanofibrils.

30. The plurality of carbide nanofibrils defined in claim 25, wherein said carbide nanofibrils predominantly have diameters in the range of about 5-50 nm.

31. The plurality of carbide nanofibrils defined in claim 30, wherein said wherein said carbide nanofibrils predominantly have diameters in the range of about 5-20 nm.

32. The plurality of carbide nanofibrils defined in claim 25, wherein most of individual ones of said nanofibrils have a generally uniform diameter.

33. The plurality of carbide nanofibrils defined in claim 25, wherein said nanofibrils are predominantly unfused to one another.

34. The plurality of carbide nanofibrils defined in claim 25, wherein Q is silicon.

35. The plurality of carbide nanofibrils defined in claim 34, wherein said nanofibrils are predominantly each a single crystal.

36. The plurality of carbide nanofibrils defined in claim 35, wherein said single crystal has a Beta crystal structure.

37. The plurality of carbide nanofibrils defined in claim 34, wherein said nanofibrils are polycrystalline.

38. An abrasive, comprising a plurality of Q-based carbide nanofibrils predominantly having diameters substantially less than about 100 nm, where Q is any metal capable of forming a carbide.

39. A nanophase high temperature, high strength composite material, comprising a high temperature, high strength metallic base material reinforced with a plurality of Q-based carbide nanofibrils predominantly having diameters substantially less than about 100 nm, where Q is any metal capable of forming a carbide.

40. A nanophase high temperature, high strength ceramic material sintered from a plurality of Q-based carbide nanofibrils predominantly having diameters substantially less than about 100 nm, where Q is any metal capable of forming a carbide.